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A new species of *Gonyosoma* Wagler, 1828 (Serpentes, Colubridae), previously confused with *G. prasinum* (Blyth, 1854)

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Abstract

A new species of the genus *Gonyosoma* Wagler is described from Yunnan Province, China. The new species closely resembles *G. prasinum* (Blyth), but it is differentiated from the latter species by the following characters: precloacal plate divided, iris blue and inside of mouth greyish-white in life. Based on phylogenetic analyses of mitochondrial cytochrome b sequence data, the new species is recovered as the sister species to *G. prasinum* by Bayesian Inference and Maximum Likelihood analyses. The uncorrected pairwise distance between the new species and other species of the genus *Gonyosoma* ranged from 11.78% to 17.07% calculated using the mitochondrial cytochrome b sequence. This discovery increases the number of *Gonyosoma* species to seven.

Key Words

Htamanthi, morphology, phylogeny, systematics, taxonomy, Yunnan

Introduction

Once considered members of a single genus, *Elaphe* Fitzinger, the ratsnakes have been divided into a number of genera including *Gonyosoma* (Burbrink and Lawson 2007; Chen et al. 2017). The genus *Gonyosoma* currently includes six recognized species, namely *G. boulengeri* (Mocquard, 1897); *G. frenatum* (Gray, 1853); *G. jansenii* (Bleeker, 1859); *G. margaritatum* Peters, 1871; *G. oxycephalum* (Boie, 1827) and *G. prasinum* (Chen et al. 2014, 2017; Uetz et al. 2021).

Gonyosoma prasinum, a wholly green, arboreal snake (Schulz 1991, 1996; Das 2002, 2012), its type locality is in Assam, Northeastern India (Blyth 1854; Boulenger 1894; Smith 1943), and has been considered to be widely distributed in India, Bhutan, Myanmar, Thailand, Malaysia, Laos, Vietnam, and China (Schulz 1996; Zhao et al. 1998; Wu et al. 2002; Vogel and Pauwels 2004; Pauwels et al. 2006; Zhao 2006; Ziegler et al. 2007; Yang and Rao 2008; Hecht et al. 2013; Pham et al. 2014; Luu et al. 2020; Nguyen et al. 2020; Wang et al. 2020; Wangyal et al. 2020; Uetz et al. 2021).

During our fieldworks in southern China and northern Myanmar from 2019 to 2020, some specimens of *Gonyosoma* cf. *prasinum* were collected, six from Yunnan Province, China, and two from Htamanthi Wildlife Sanctuary, northwestern Myanmar, relatively close to the type locality of *G. prasinum*. The specimens from China and Myanmar showed some differences in scale counts and coloration in life. In addition, phylogenetically, the sequences of the specimens from China and from Myanmar were placed in two separate clades and had an obvious genetic divergence. Therefore, we treated the specimens from China and from Myanmar to be two distinct species.

The question was, which one is the true *Gonyosoma prasinum*? As no molecular data for the type specimens

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is available, we can only solve this problem through morphological characteristics. However, we cannot judge this problem from the original description (Blyth 1854) of *G. prasinum* as it is too short and not detailed enough. Since most of the subsequent descriptions and photographs (e.g., Boulenger 1894; Smith 1943; Schulz 1996; Cox et al. 1998; Zhao et al. 1998; Zhao 2006; Yang and Rao 2008; Das 2010, 2012; Shi et al. 2011; Purkayastha 2013; Qi 2019) of *G. prasinum* are either quoted from previous publications or based on specimens whose collection sites are distant from the type locality, these specimens may not be the true *G. prasinum*, so these data cannot be used here. We can only identify this species according to the descriptions and photographs (e.g., Das 2013; Khandekar et al. 2021) of specimens originating from its type locality and its vicinities.

Materials and methods

Sampling

Field surveys in Yunnan, China, were conducted under the permits of Xishuangbanna National Natural Reserve Management Bureau and Wuliangshang National Nature Reserve Management Bureau. Field survey in Northern Myanmar was undertaken at the invitation of the Republic of the Union of Myanmar, Ministry of Natural Resources and Environmental Conservation, Forest Department, Forest Research Institute. Four specimens (KIZ2019025–KIZ2019028) were collected from Mengla County, Yunnan Province, China, in April to May 2019, one specimen (KIZ20200729) was collected from Zhenyuan County, Yunnan Province, China, in July 2020, one specimen (KIZ20200903) was collected from Menglian County, Yunnan Province, China, in September 2020, and two specimens (SEABRI2019120043, SEABRI2019120075) were collected from Htamanthi wildlife sanctuary, Sagaing, Myanmar, in December 2019. Specimens were collected by hand, and photographs were taken to document color pattern in life prior to euthanasia. Liver tissues were stored in 99% ethanol and snakes were preserved in 75% ethanol. The specimens from China were deposited in Kunming Institute of Zoology, Chinese Academy of Sciences (KIZ) and the specimens from Myanmar were deposited in Southeast Asia Biodiversity Research Institute, Chinese Academy of Sciences (SEABRI).

Molecular data and phylogenetic analyses

All species of the genus *Gonyosoma* were included in the study. Homologous sequences were obtained from GenBank. Six samples from China and two sample from Myanmar were incorporated in the analysis, and the new sequences have been deposited in GenBank. *Elaphe taeniura* (Cope) and *Coelognathus radiatus* (Boie) were used as outgroups. All the GenBank accession numbers for taxa used in this study were listed in Table 1.

Table 1. Sequences of cytb gene used in this study.

Species	Voucher	Locality	Accession
Coelognathus radiatus	CHS556	Wenshan, Yunnan, China	MK201411
Elaphe taeniura	CHS203	Xiangcheng, Sichuan, China	MK201333
Gonyosoma boulengeri	YPX11032	/	AF471053
	CHS242	Mengzi, Yunnan, China	MK201360
	CHS243	Hainan, China	MK201361
Gonyosoma frenatum	YPX11027	/	KF669250
	HS11038	/	KF669251
	EXTRACTION	/	KF669246
	/	/	DQ902110
	CHS138	Huangshan, Anhui, China	MK201289
	CHS139	Huangshan, Anhui, China	MK201290
Gonyosoma jansenii	/	Sulawesi	DQ902113
	KU 321724	Zamboanga, Mindanao, Philippines	KC010343
Gonyosoma margaritatum	/	/	KM870886
Gonyosoma oxycephalum	/	/	AF471084
	ROM 37622	/	KX694870
Gonyosoma prasinum	SEABRI2019120043	Htamanthi, Sagaing, Myanmar	MZ322864
	SEABRI2019120075		MZ322863
Gonyosoma coeruleum sp. nov.	KIZ2019025	Mengla, Yunnan, China	MZ322870
	KIZ2019026		MZ322869
	KIZ2019027		MZ322868
	KIZ2019028		MZ322867
	KIZ20200729	Zhenyuan, Yunnan, China	MZ322866
	KIZ20200904	Menglian, Yunnan, China	MZ322865

DNA was extracted using DNeasy Blood and Tissue kit (Qiagen, Germany) following the manufacturer's instructions. A fragment of mitochondrial cytochrome b (cytb) gene was amplified using the primer pair L14910: 5'–GACCTGTGATMTGAAAACCAYCGTT–3' and H16064: 5'–CTTTGGTTTACAAGAACAATGCTTTA–3' (Burbrink et al. 2000). PCR amplifications were performed in 25 μl reactions by using the following cycling conditions: initial denaturation for 120 s at 95 °C, followed by 35 cycles: denaturation at 94 °C for 40 s, annealing at 48.5 °C for 25 s, elongation at 72 °C for 15 s, and then finalized with elongation step of 120 s at 72 °C, with the PTC-100 thermal cycler (BioRad, USA). The products were purified by using the DNA Agarose Gel Extraction Kit (Omega, USA) according to the manufacturer's instructions. Purified PCR products were sequenced using the same PCR primers. Sequencing was completed by Beijing Qingke New Industry Biotechnology Co., Ltd. Sequences were edited and manually managed using SeqMan in Lasergene 7.1 (DNASTAR Inc., Madison, WI, USA) and MEGA X (Kumar et al. 2018).

Sequences were aligned using ClustalX 2.0 (Thompson et al. 1997) with the default parameters. Pairwise distances between species were calculated in MEGA X (Kumar et al. 2018). The best substitution models HKY+F+I+G4 and GTR+F+I+G4 were selected for Bayesian inference and Maximum Likelihood analysis, respectively, using the Akaike Information Criterion (AIC) in ModelFinder (Kalyaanamoorthy et al. 2017).

Bayesian inference was performed in MrBayes 3.2.7 (Ronquist et al. 2012). Two runs were performed simultaneously with four Markov chains starting from random tree. The chains were run for 10,000,000 generations and sampled every 1000 generations. The first 25% of the sampled trees was discarded as burn-in after the standard deviation of split frequencies of the two runs was less than a value of 0.01, and then the remaining trees were used to create a 50% majority-rule consensus tree and to estimate Bayesian posterior probabilities. Maximum Likelihood analysis was performed in RaxmlGUI 2.0 (Silvestro and Michalak 2012), nodal support was estimated by 1,000 rapid bootstrap replicates.

Morphology

Body and tail lengths were measured with a ruler to the nearest 1 mm (Jablonski et al. 2019). Scale counts were taken following Janssen et al. (2019). Ventral scales were counted according to Dowling (1951). Bilateral scale counts were given as left / right order. Abbreviations of morphological characters are as follows: Atem, number of anterior temporals; DSR, dorsal scale rows number at one head length posterior to the head – number of dorsal scale rows at midbody – number of dorsal scale rows at one head length anterior to the vent, respectively; IL, infralabials (counted on lower lips); Lor, loreals; Lor / eye, loreal scale touching the eye (yes or no); PostOc, postoculars; Prec, precloacal plate (corresponds to term anal plate in older literature) (single or divided); PreOc, preoculars; PTem, number of posterior temporals; SL, supralabials (counted on upper lips); SL / orbit, number of supralabials entering orbit; SubC, number of subcaudal scales; SVL, snout-vent length (from tip of snout to vent); TaL, tail length; TaL / TL, ratio of tail length / total length; TL, total length; Ven, number of ventral scales.

Results

The topologies derived from Bayesian inference and Maximum Likelihood analysis were consistent (Fig. 1). The sequences of the specimens from China formed a separate clade sister to the sequences of the specimens from Myanmar, however, the nodal supports were low. The average uncorrected pairwise distance (p-distance) between the sequences of the specimens from China and the sequences of the specimens from Myanmar is 11.78%. (Table 2).

Morphological measurements, scale counts and colorations in life were presented in Table 3. The coloration of the iris of the specimens from Myanmar and from China in life are obviously different, the coloration of the iris of the specimens from Myanmar in life is greenish yellow (Figs 4B, 5C, D) while the colorations of the iris of the specimens from China are blue (Figs 4A, 5A, B). Besides this difference, the precloacal plates of the specimens from Myanmar are single (Fig. 4F) while the precloacal plates of the specimens from China are divided (Fig. 4E). According to the photographs (Khandekar et al. 2021) of *Gonyosoma prasinum* in life from the type locality and the vicinities of the type locality, the colorations of the iris are all greenish-yellow. In addition, according to the description of *Gonyosoma prasinum* based on a specimen from Namchik, Arunachal Pradesh (Das 2013), which is close to the type locality, the precloacal plate is single. Therefore, we consider the specimens from Myanmar to be conspecific with the true *G. prasinum* and the specimens from China to belong to a new species.

Table 2. Average uncorrected p-distances (%) between members of *Gonyosoma* and outgroups calculated from cytb gene sequences.

	1	2	3	4	5	6	7	8
1 *Gonyosoma coeruleum* sp. nov.								
2 *Gonyosoma boulengeri*	13.01							
3 *Gonyosoma frenatum*	13.35	7.56						
4 *Gonyosoma jansenii*	17.07	15.63	16.88					
5 *Gonyosoma margaritatum*	12.33	12.51	12.41	16.91				
6 *Gonyosoma oxycephalum*	15.77	15.32	16.36	7.75	15.98			
7 *Gonyosoma prasinum*	11.78	12.89	12.65	17.69	12.71	15.96		
8 *Coelognathus radiatus*	19.32	18.40	18.15	19.49	18.97	19.66	17.35	
9 *Elaphe taeniura*	16.27	15.56	15.59	16.21	16.07	16.92	16.32	15.90

Gonyosoma coeruleum sp. nov.

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Figs 2, 3, 4A, C, E, 5A, B, 7B

Holotype. KIZ2019028, adult female, Mengla County, Xishuangbanna Autonomous Prefecture, Yunnan Province, China, 29 April 2019, 21°32'12"N, 101°32'51"E, 900 m a.s.l.

Paratypes. KIZ2019025, one adult female and KIZ2019026–KIZ2019027, two adult males, Mengla County, Xishuangbanna Autonomous Prefecture, Yunnan Province, China, 4 May 2019, 21°55'9"N, 101°32'12"E, 890 m, a.s.l. KIZ20200729, adult female, collected from Zhenyuan County, Puer City, Yunnan Province, China, 29 July 2020, 24°3'37"N, 101°3'43"E, 1,240 m a.s.l. KIZ20200904, one juvenile, collected from Menglian County, Puer City, Yunnan Province, China, 3 September 2020, 22°10'16"N, 99°18'31"E,1,200 m a.s.l.

Etymology. The specific epithet "*coeruleum*" is the neutral gender of the Latin adjective *coeruleus* (a, um) meaning "blue", and is given in reference to the coloration of the iris of this species.

Diagnosis. Body size medium (SVL 656–833mm in adults); body slender, head elongated and distinct from neck; large eyes with round pupil; tail long (23–28% of total length) and slender; dorsal scales in 19-19-15 rows, 7–11 rows of mid-dorsal scales keeled; single preocular;

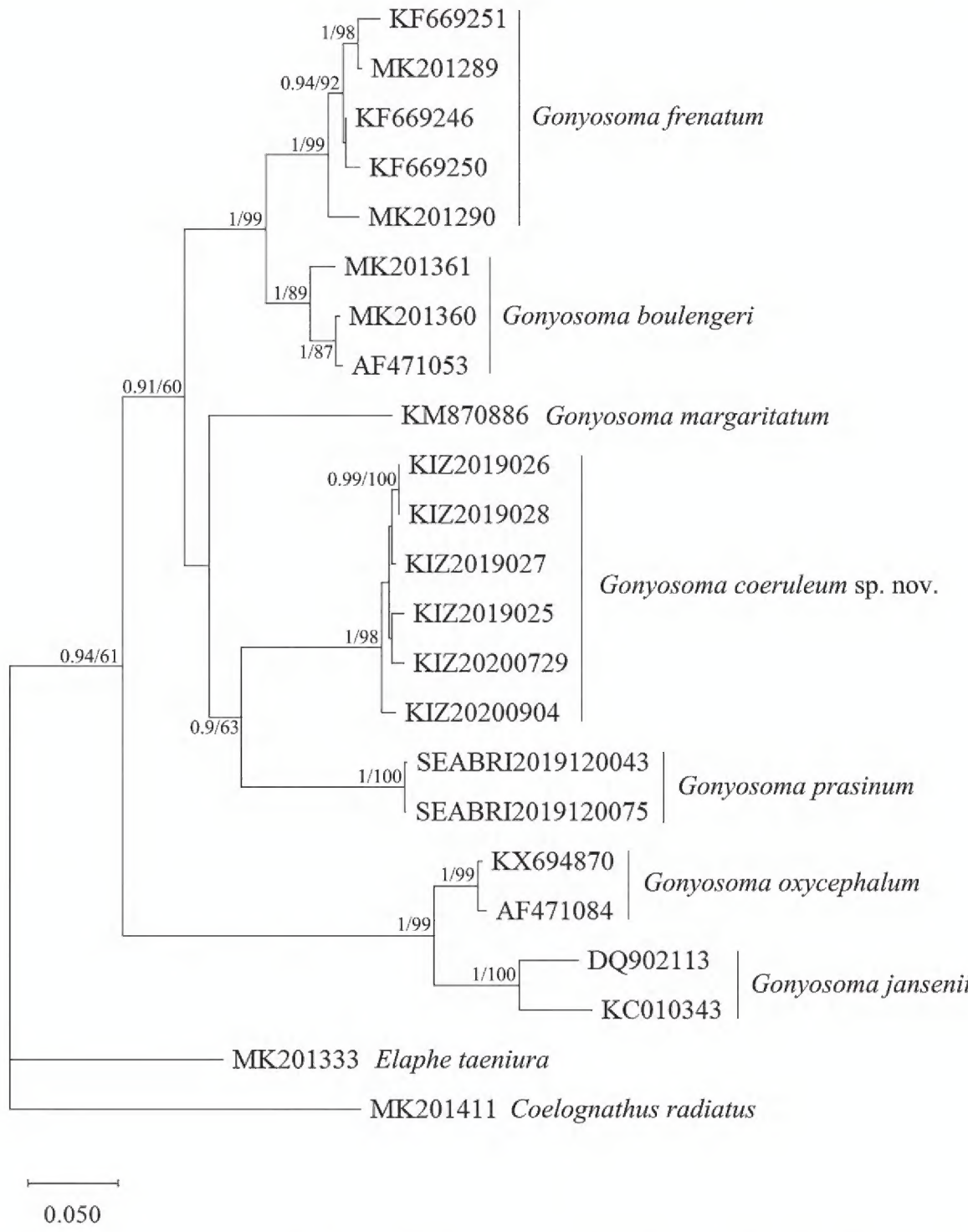

Figure 1. The consistent phylogram inferred from Bayesian Inference and Maximum Likelihood analyses based on cytb gene sequences. Numbers before slashes indicate Bayesian posterior probabilities (values below 0.9 were not shown) and numbers after slashes indicate bootstrap support for Maximum Likelihood analyses (values below 60 were not shown).

Table 3. Measurements (in mm), scalation data, and coloration of *Gonyosoma coeruleum* sp. nov. and *G. prasinum*. For abbreviations see Materials and methods.

	***Gonyosoma coeruleum* sp. nov.**						***Gonyosom prasinum***	
	KIZ2019028 Holotype	**KIZ2019025 Paratype**	**KIZ2019026 Paratype**	**KIZ2019027 Paratype**	**KIZ20200729 Paratype**	**KIZ20200904 Paratype**	**SEABRI2019120043**	**SEABRI2019120075**
Sex	Female	Female	Male	Male	Female	Juvenile	Male	Male
SVL	814	656	833	719	696	388	487	577
TL	1058	863	974+	992	918	511	656	779
TaL	245	207	141+	273	222	123	169	202
TaL / TL	0.23	0.24	0.14+	0.28	0.24	0.24	0.26	0.26
SL	8/9	9/9	9/9	9/9	9/9	9/9	9/9	9/9
SL / orbit	3-5/4-6	4-6	4–6	4–6	4–6	4–6	4–6	4–6
IL	10/10	10/10	10/10	10/10	11/10	10/10	11/10	10/10
PreOc	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
PostOc	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2
Lor	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
Lor / eye	no	No	no	no	no	no	no	no
Atem	2/2	2/2	2/2	1/1	1/2	1/1	1/1	1/2
PTem	2/2	3/2	2/2	2/2	2/2	2/2	1/1	2/2
DSR	19-19-15	19-19-15	19-19-15	19-19-15	19-19-15	19-19-15	19-19-13	19-19-15
Ven	202	199	196	190	189	195	194	193
SubC	89	103	44+	106	93	105	104	105
Prec	Divided	Divided	Divided	Divided	Divided	Divided	Single	Single
Body color	Green	Green	Green	Green	Green	Green	Green	Green
Tongue color	Brownish yellow	Brownish yellow	Brownish yellow	Brownish yellow	Brownish yellow	Brownish yellow	Brownish yellow	Brownish yellow
Inside of mouth	Greyish white	Greyish white	Greyish white	Greyish white	Greyish white	Greyish white	Pink	Pink
Iris color	Blue	Blue	Blue	Blue	Blue	Blue	Greenish yellow	Greenish yellow

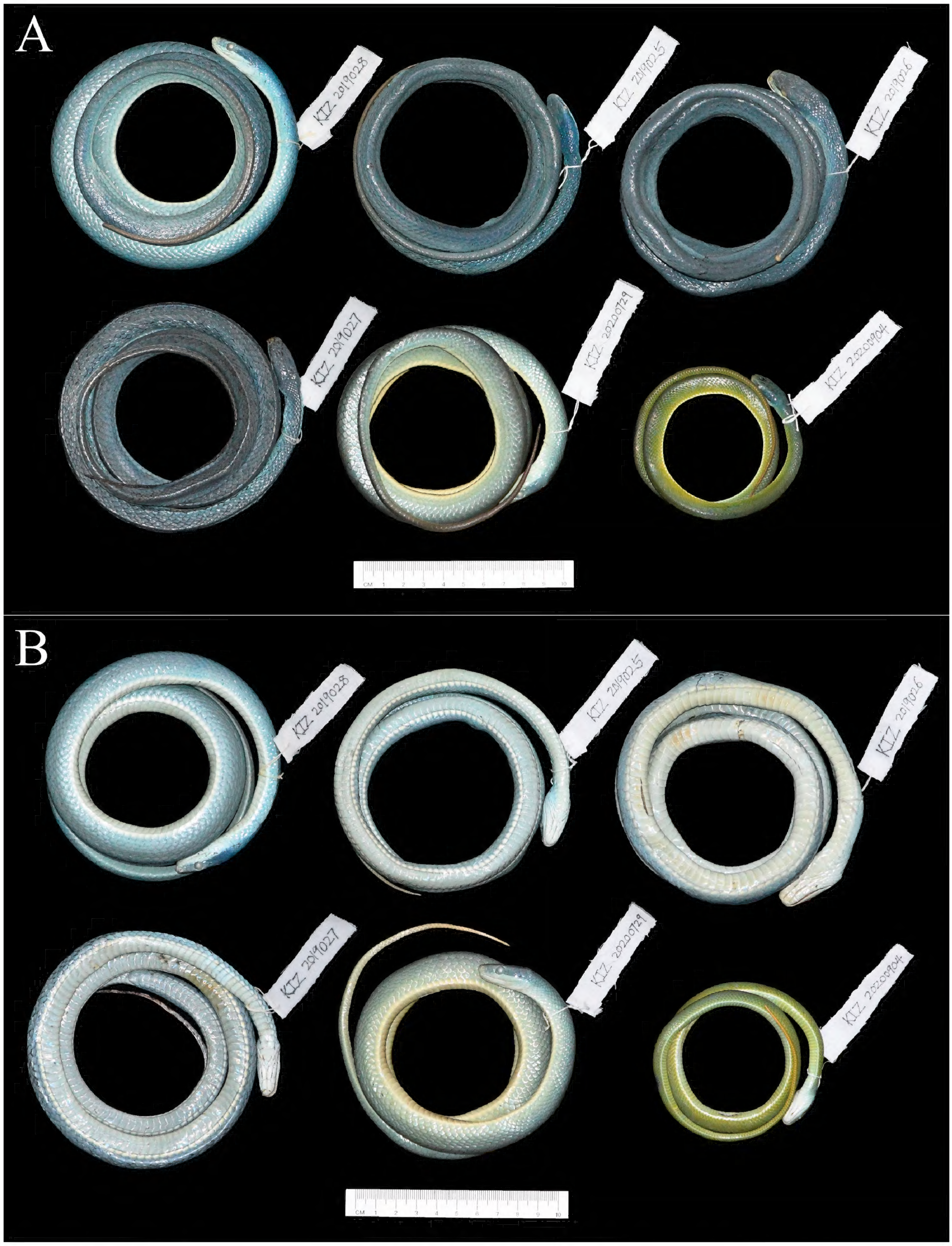

Figure 2. Type series of *Gonyosoma coeruleum* sp. nov. in preservative. **A** dorsal view **B** ventral view.

two postoculars; one or two anterior temporals and two or three posterior temporals; 189–202 ventral scales; 89–106 paired subcaudals; precloacal plate divided. Dorsal surface bright green with brownish-yellow tip of tail, iris blue, inside of mouth greyish white; tongue brownish yellow with black tips.

Description of the holotype. Head elongate, distinct from the neck, flattened, longer than wide, narrowed

Figure 3. Head views of the holotype (KIZ2019028) of *Gonyosoma coeruleum* sp. nov. in preservative. **A** dorsal **B** ventral **C** right **D** left.

anteriorly; nostril lateral; eye large, pupils round; rostral triangular, broader than high, visible from above; nasal divided into two scales; two internasals, wider than high, bordered by two large prefrontals posteriorly; frontal single, enlarged, pentagonal, narrowed posteriorly; parietals longer than wide, in contact with each other; supralabials 8/9, first and second in contact with the prenasal and postnasal, third and fourth entering orbit on left side, fourth and sixth entering orbit on right side, eighth largest; infralabials 10/10, first pair in broad contact with each other, first to fifth in contact with anterior pair of chin shields; anterior and posterior pairs of chin shields elongate, second pair meeting in midline; preocular 1/1; postoculars 2/2, lower ones smaller, bordering anterior temporals; anterior temporals 2/2, posterior temporals 2/2. SVL 814 mm; TaL 245 mm; TaL/TL 0.23; DSR 19-19-15, nine rows keeled in the vertebral region, otherwise smooth; ventrals 202 with a lateral keel; subcaudals 89, paired; precloacal plate divided.

Color of holotype in life. Dorsal surface bright green with brownish-yellow tip of tail, reticulate pattern consisting of yellow, black, and white on the interstitial skin; upper lips yellowish-green; anterior ventral surface greenish-white and posterior ventral surface light green; tip of tail brownish-yellow on its ventral surface; ventrals outside the lateral keel usually yellowish-white; iris blue; pale grey inside of mouth; tongue brownish-yellow with black tips.

Variations. The paratypes resemble the holotype in most aspects except that the rows of mid-dorsal scales keeled vary from seven to eleven, anterior temporals vary from one to two, and posterior temporals vary from two to three in paratypes; moreover, the male paratype KIZ2019027 has a relatively longer tail (TaL/TL 0.28).

Distribution. *Gonyosoma coeruleum* sp. nov. is currently known from Xishuangbanna Autonomous Prefecture and Puer City, Yunnan Province, China (Fig. 6), it is probably also distributed in other parts of Yunnan Province and Sichuan, Guizhou, and Hainan Province, China, as well as Southern Myanmar, Thailand, Laos, and Vietnam.

Natural history. The specimens from Mengla County were collected on big trees bordering rivers, the specimen from Zhenyuan County was collected on a big tree on the side of a small road in forest, and the specimen from Menglian County was collected on a small tree bordering

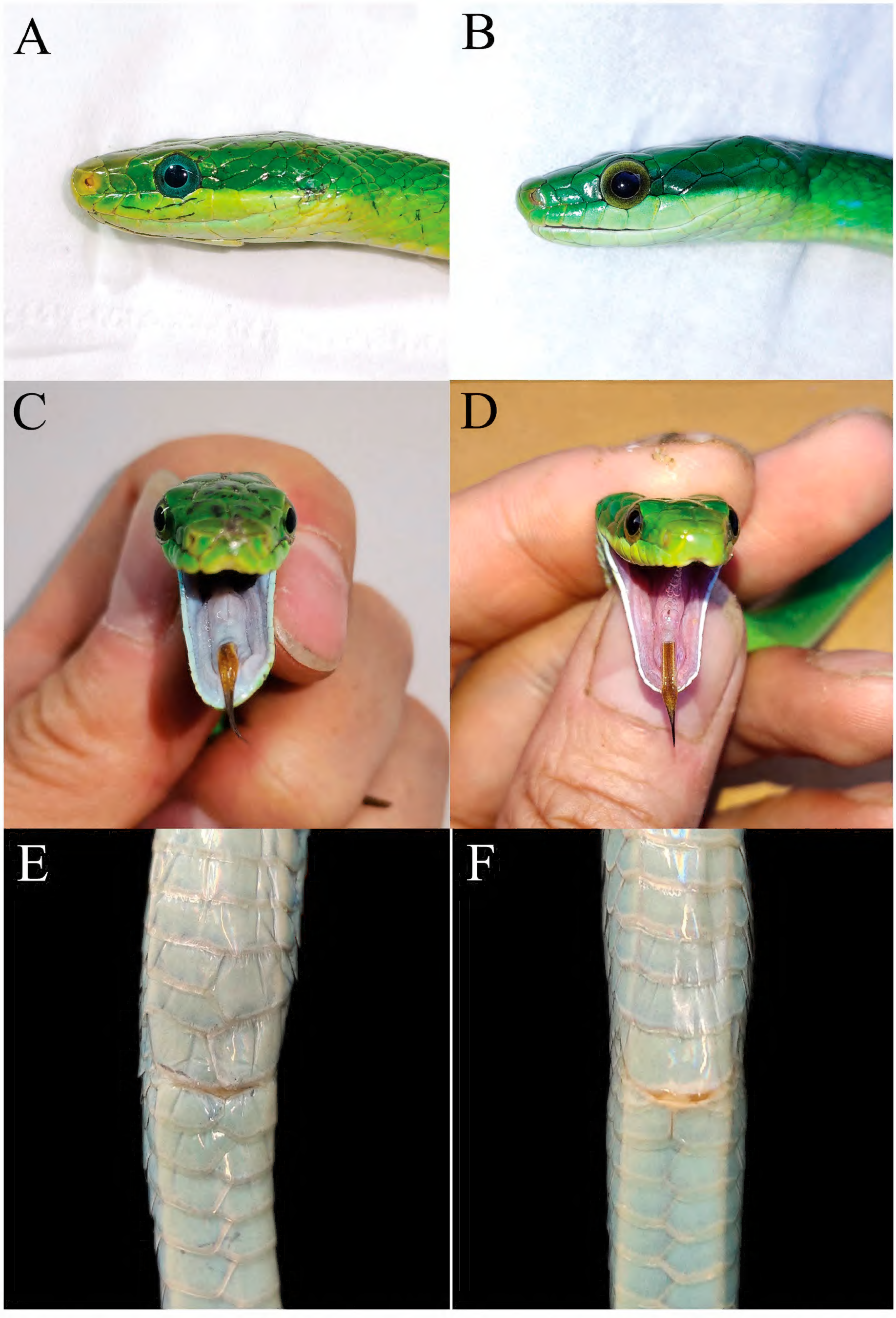

Figure 4. Comparisons of the colors of iris, the colors of inside of mouth, and the precloacal plates. **A, C,** and **E** the holotype (KIZ2019028) of *Gonyosoma coeruleum* sp. nov. **B, D,** and **F** the specimen (SEABRI2019120043) of *G. prasinum*.

Figure 5. The specimens of *Gonyosoma coeruleum* sp. nov. and *G. prasinum* in life. **A** the female paratype (KIZ20200729) of *Gonyosoma coeruleum* sp. nov. **B** the juvenile paratype (KIZ20200904) of *Gonyosoma coeruleum* sp. nov. **C** the specimen (SEABRI2019120043) of *G. prasinum* from Myanmar **D** the specimen (SEABRI2019120075) of *G. prasinum* from Myanmar.

a stream. All specimens were found at night while they were asleep on tree branches, what shows that this species is diurnal. Through direct observation, we found that they like to feed on small rodents, and whether they also prey on other animals is unknown.

Comparisons. *Gonyosoma coeruleum* sp. nov. can be distinguished from *G. boulengeri* in lacking a nasal appendage (vs. rostral distinct from the nasal appendage), and no dark stripe behind the eye (vs. an indistinct dark stripe behind the eye) (Mocquard 1897; Smith 1943).

Gonyosoma coeruleum sp. nov. is distinguishable from *G. frenatum* based on its single, distinct loreal (vs. loreal united with the prefrontal), and no black streak along the side of the head (vs. a black streak along the side of the head above the supralabials) (Gray 1853; Boulenger 1894; Smith 1943).

Gonyosoma coeruleum sp. nov. can be separated from *G. jansenii* by having 19 midbody dorsal scale rows (vs. 23–25), and dorsal surface uniform bright green with brownish-yellow tip of tail (vs. olive or yellowish-brown, entirely black posteriorly and on the tail) (Bleeker 1859; Boulenger 1894).

From *Gonyosoma margaritatum*, *Gonyosoma coeruleum* sp. nov. can be differentiated by its dorsal surface uniform bright green with brownish-yellow tip of tail (vs. black, each scale with a yellowish green spot, or green with black borders to the scales, hinder part of body and tail with bright orange rings), and no black streak on each side of the head (vs. a black streak on each side of the head behind the eye) (Peters 1871; Boulenger 1894).

From *Gonyosoma oxycephalum*, *Gonyosoma coeruleum* sp. nov. can be differentiated by the different colors of tail (green with brownish-yellow tip vs. the whole tail light chestnut or buff-red or yellowish brown), no blackish stripe along the side of the head (vs. an indistinct blackish stripe along the side of the head immediately above the supralabials), and the number of midbody dorsal scale, 19 rows (vs. 23–27 rows) (Boie 1827; Boulenger 1894; Smith 1943).

Gonyosoma coeruleum sp. nov. closely resembles *G. prasinum*, but the colorations of their iris in life are obviously different, the iris of *Gonyosoma coeruleum* sp. nov. is blue (Fig. 4A) while the iris of *G. prasinum* is greenish-yellow (Fig. 4B; Khandekar et al. 2021). The colours of the inside of mouth are slightly different, the inside of mouth of *Gonyosoma coeruleum* sp. nov. is pale grey (Fig. 4C) while it is pink (Fig. 4D) in *G. prasinum*. In addition, the precloacal plate of *Gonyosoma coeruleum* sp. nov. is divided (Fig. 4E) while it is single (Fig. 4F; Das 2013) in *G. prasinum*.

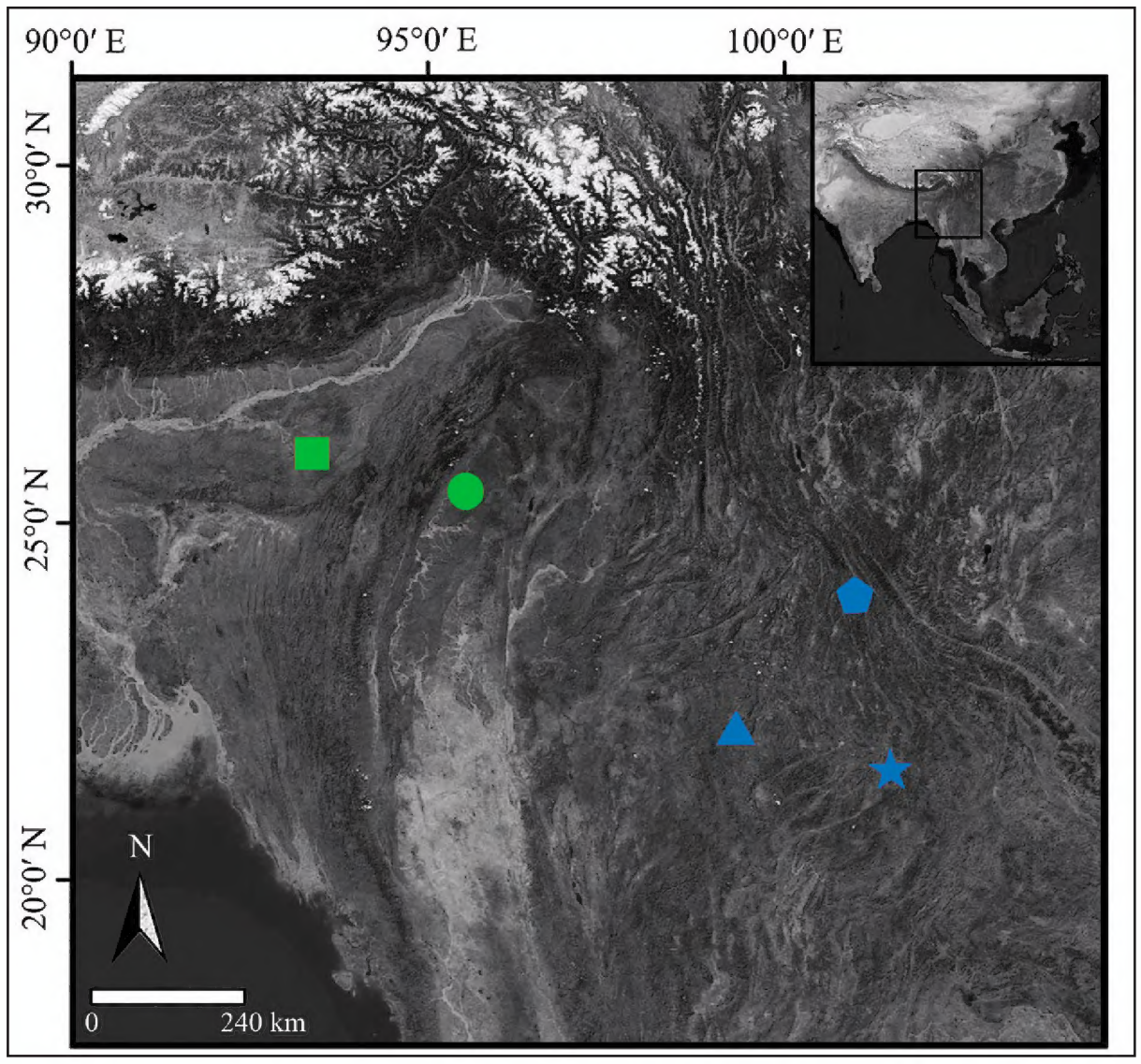

Figure 6. Map showing the type locality of *Gonyosoma coeruleum* sp. nov. (blue star) in Mengla County, Yunnan Province, China; the other collection sites of *Gonyosoma coeruleum* sp. nov. in Zhenyuan County (blue pentagon) and Menglian County (blue triangle), Yunnan Province, China; the type locality (green square) of *G. prasinum* in Assam, India; and the new collection site (green dot) of *G. prasinum* in Htamanthi wildlife sanctuary, Sagaing, Myanmar.

Figure 7. A habitat at the type locality of *Gonyosoma coeruleum* sp. nov. **B** *Gonyosoma coeruleum* sp. nov. asleep on a tree at night.

Discussion

One type specimen of *Gonyosoma prasinum* is currently available in the Natural History Museum, London (BMNH 1946.1.10.22). We have tried to check the type specimen but failed due to the pandemic circumstances. However, we collected two specimens from northwestern Myanmar, where relatively close to the type locality, and these two specimens agree with the descriptions and photographs (Das 2013; Khandekar et al. 2021) of *G. prasinum* from the type locality and its vicinities, therefore we can confirm that the specimens from northwestern Myanmar belongs to *G. prasinum*.

Although there is no major difference in scalation between the new species and *Gonyosoma prasinum* in morphological characters, however, the colorations of the iris of them in life are obviously different. As, furthermore, the new species and *G. prasinum* have a large genetic divergence, they therefore deserve distinct a distinct status at species level.

Previously, *Gonyosoma prasinum* has been recorded in India, Bhutan, Myanmar, Thailand, Malaysia, Laos, Vietnam, and China (Wangyal et al. 2020; Uetz et al. 2021), and within China, it was recorded from Yunnan, Guizhou, Sichuan, and Hainan Provinces (Zhao et al. 1998; Wu et al. 2002; Zhao 2006; Yang and Rao 2008; Shi et al. 2011). However, we speculate that *G. prasinum* is only distributed in India, Bhutan, northern Myanmar, and Southeastern Tibet, China. Based on the photographs (eg. Vogel and Pauwels 2004; Pauwels et al. 2006; Zhao 2006; Ziegler et al. 2007; Yang and Rao 2008; Shi et al. 2011; Hecht et al. 2013; Pham et al. 2014; Qi 2019; Luu et al. 2020; Nguyen et al. 2020; and unpublished data) of snakes previously identified as *G. prasinum* from other parts of Yunnan Province, and Sichuan, Guizhou, and Hainan Province, China, Thailand, Laos, and Vietnam, through the coloration of the iris, we speculate that these populations also belong to *Gonyosoma coeruleum* sp. nov. For the populations distributed in Malaysia, as we do not have specimens and photographs, whether they also belong to *Gonyosoma coeruleum* sp. nov. is still unknown.

Gonyosoma coeruleum sp. nov. is a familiar species in southern Yunnan, China, however, we observed that *Gonyosoma coeruleum* sp. nov. was often captured and traded as pets due to its beautiful appearance. In order to protect this beautiful species, we suggest that this species to be added to the local protected animal lists and be banned from pet trading.

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